E 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648-XB634]

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to BNSF Railway Bridge Heavy Maintenance Project in King County, Washington

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; proposed incidental harassment authorizations; request for comments on proposed authorizations and possible renewals.

SUMMARY: NMFS has received a request from BNSF Railway (BNSF) for authorization to take marine mammals incidental to a Railway Bridge Heavy Maintenance Project in King County, Washington. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue two consecutive incidental harassment authorization (IHAs) to incidentally take marine mammals during the specified activities. NMFS is also requesting comments on possible one-time, one-year renewals for each IHA that could be issued under certain circumstances and if all requirements are met, as described in **Request for Public Comments** at the end of this notification. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorizations and agency responses will be summarized in the final notice of our decision.

DATES: Comments and information must be received no later than **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service. Written comments should be submitted via email to *ITP.Pauline@noaa.gov*.

Instructions: NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments, including all attachments, must not exceed a 25-megabyte file size. All comments received are a part of the public record and will generally be posted online at *www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act* without change. All personal identifying information (*e.g.*, name, address) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

FOR FURTHER INFORMATION CONTACT: Robert Pauline, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act*. In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

The MMPA prohibits the "take" of marine mammals, with certain exceptions. sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq*.) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are proposed or, if the taking is limited to harassment, a notice of a proposed incidental harassment authorization is provided to the public for review.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other "means of effecting the least practicable adverse impact" on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stocks for taking for certain subsistence uses (referred to in shorthand as "mitigation"); and requirements pertaining to the mitigation, monitoring and reporting of the takings are set forth.

National Environmental Policy Act

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq*.) and NOAA Administrative Order (NAO) 216-6A, NMFS must review our proposed action (*i.e.*, the issuance of IHAs) with respect to potential impacts on the human environment.

This action is consistent with categories of activities identified in Categorical Exclusion B4 (IHAs with no anticipated serious injury or mortality) of the Companion Manual for NOAA Administrative Order 216-6A, which do not individually or cumulatively have the potential for significant impacts on the quality of the human environment and for which we have not identified any extraordinary circumstances that would preclude this categorical exclusion. Accordingly, NMFS has preliminarily determined that the issuance of the proposed IHAs qualifies to be categorically excluded from further NEPA review.

We will review all comments submitted in response to this notification prior to concluding our NEPA process or making a final decision on the IHA request.

Summary of Request

On August 17, 2021, NMFS received a request from BNSF Railway (BNSF) for two consecutive IHAs allowing the take of marine mammals incidental to the Railway Bridge 0050-0006.3 (Bridge 6.3) Heavy Maintenance Project in King County, Washington. The application was deemed adequate and complete on November 22, 2021. BNSF's request is for take of a small number of seven species of marine mammal by Level B harassment and Level A harassment. Neither BNSF nor NMFS expects serious injury or mortality to result from this activity and, therefore, IHAs are appropriate.

Description of Proposed Activity

Overview

BNSF is proposing to engage in maintenance activities at Bridge 6.3, a bridge with a movable deck to allow vessels to pass. The purpose of this project is to extend the service life of the existing structure by replacing several components of the existing movable span including replacing the existing counterweight, counterweight trunnion bearings, and rocker frame system of the existing movable span. This work would occur over two years, requiring the issuance of two consecutive IHAs.

In-water activities that could result in take of marine mammals include impact pile driving of 36-inch temporary steel piles (which will be removed via cutting with Broco Rod which is not likely to cause take), vibratory installation and extraction of 14-inch H-piles, vibratory installation and extraction of 12-inch timber piles, hydraulic clipper cutting and extraction of 12-inch timber piles, drilling of 48-inch diameter shafts using oscillator rotator equipment, and removing the pile created by filling the drilled shaft and steel casing with concrete and removing the casing with a diamond wire saw.

Bubble curtains will be used during impact pile driving to reduce in-water sound levels. The work would occur over two years during July 16 through February 15 of each year due to the U.S. Army Corp of Engineers (USACE) in-water work window restrictions for salmonids.

Dates and Duration

BSNF anticipates that the project will requires approximately 122 days of in-water work over 24 months. The proposed IHAs would be effective from July 16, 2022 to July 15, 2023 for Year 1, which would include 113 days of in-water activities and July 16, 2023 to July 15, 2024 for Year 2, which would include 9 days of in-water activities.

Specific Geographic Region

The project activities will occur at BNSF Bridge 6.3, in Ballard, WA, which is located in King County at Latitude 47.666784° North by Longitude -122.402108° West. The Bridge spans the Lake Washington Ship Canal which runs through the city of Seattle and connects the fresh water body of Lake Washington with Puget Sound's Shilshole Bay. The Bridge is located just west of the Hiram M. Chittenden Locks and is the last bridge to span the Lake Washington Ship Canal before it flows into Puget Sound 2,500 ft (772 m) to the west. The Bridge is approximately 1,144 ft (349 m) long and was built in 1917 (See Figure 1). The substrate below the ordinary high water mark (OHWM) is composed of sandy silt intermixed with gravels and riprap. Approximately 75 percent of the Canal shoreline is developed with armored bulkheads, ship holding areas, and other artificial structures.

The nearest pinniped haulouts are located 0.82 mi (Shilshole Bay Jetty) and 1.42 mi (West Point Buoy) away but not in direct line of sight with the construction activity as shown in Figure 6 in the Application.

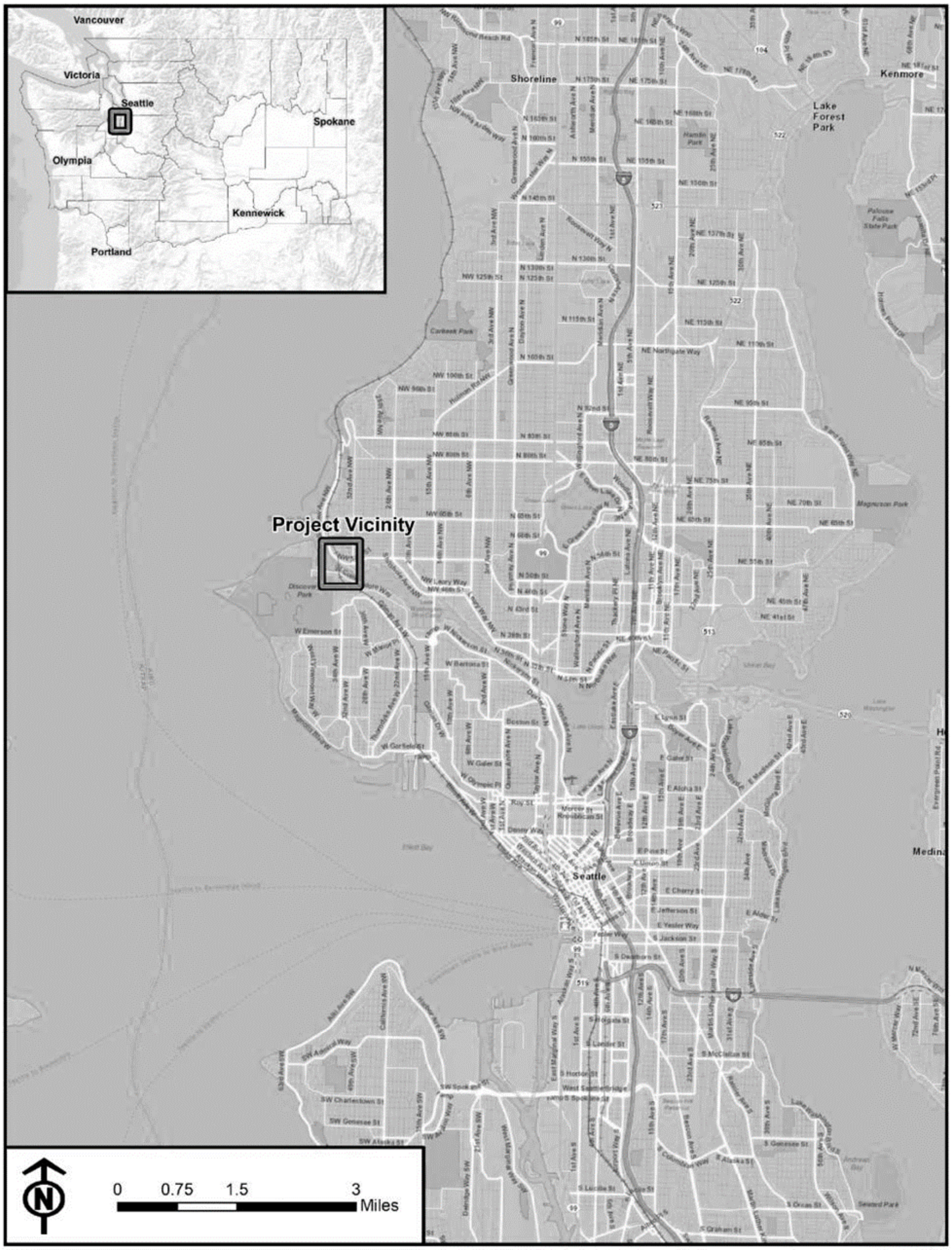

Figure 1. Railway Bridge 6.3 Location

Detailed Description of Specific Activity

Bridge 6.3 consists of 18 spans supported by 19 piers. Pier 1 is the southern abutment, and Pier 19 is the northern abutment. Piers 6 through 11 are either at the edge of or below the OHWM of the Canal. Pier 6 is at the southern shoreline, adjacent to Commodore Park, and extends partially below the OHWM. Pier 11 is at the base of a steep slope at the northern shoreline and extends partially below the OHWM. Piers 7 through 10 are fully within the Canal. Pier 7 is near the middle of the Canal, and Piers 8, 9, and 10 are to the north of the north guide wall. Span 7 is a movable span (Strauss Heel-Trunnion Bascule) that rotates clockwise up when opening for marine vessels that cannot pass under the bridge when it is in the closed (down) position. (See Appendix A in Application for additional detail).

Work trestles are required to provide access to the superstructure above Piers 8, 9, and 10. Cranes and associated construction equipment will be used atop the work trestles to install the temporary drilled shafts and then replace the existing counterweight, counterweight trunnion bearings, and rocker frame system.

The overall construction process can be segmented into following primary phases:

1. Site Mobilization;

2. Demolish Residential Structures;

3. Install Work Trestles;

4. Install Drilled Shafts;

5. Replace Bascule Span Components;

6. Remove Work Trestles; and

7. Site Demobilization

Only phase 2, 3, 4 and 6 involve in-water work which could result in the harassment of marine mammals. Therefore, the other phases will not be discussed further, although additional information may be found in the application.

Demolish Residential Structures

Previous owners of an adjacent parcel had expanded their dock/deck, float, and shed onto the BNSF right-of-way to the extent that a portion of their structure is attached to bridge Pier 11. This dock and shed are within the footprint of where the western work trestle will be installed and in the general vicinity of where construction barges may need to be deployed. These structures are supported by in-water 80 12-inch timber piles that must be removed prior to installation of the work trestles.

Install Work Trestles

Two temporary work trestles are required to provide construction access to the moveable span, as well as a work platform for support cranes and associated construction equipment and supplies. Each work trestle is composed of a series of large wood planks that rest on steel crossbeams that are welded onto the top of steel support pipe piles. The number and size of the steel pipe piles required for the project is dictated by the anticipated weight of the cranes, counterweight, steel beams, trunnion bearings, support equipment, and industry standard safety factor. All piles will be proofed to a predetermined loading capacity. Each work trestle will be approximately 240 ft (73 m) long by 45 ft (13.7.m) wide. A total of 170 temporary piles (140 in–water and 30 above water) are required (Table 1). A 20 percent contingency is included in this estimate. Pile types include 136 36-inch steel pipe piles and 34 14-inch H-piles.

Table 1. Temporary Pile Summary by Construction Purpose

Pile Size (inch)	Pile Type	Pile Use	In-Water	Uplands	Total
36	Steel Pipe	Trestle Support	116	20	136
14	H-Pile	Trestle Approach	0	8	8
14	H-Pile	Turbidity Fencing	20	0	20
Subtotal			136	28	140
14	H-Pile	20% Contingency	4	2	6
TOTAL			140	30	170

Trestle approach piles and trestle support piles will be installed with an impact hammer from start to finish due to concerns associated with movement of the existing bridge. A bubble curtain will be utilized during all impact pile driving when water depth is greater than 2 ft (0.6 m). In-water 14-inch H-piles for turbidity fencing will be installed with a vibratory hammer.

Concurrent impact driving of 36-inch steel pipes may be utilized, but BNSF may select to only utilize one pile-driving crew depending on schedule, rate of progress, and number of days remaining in the allowable in-water work window.

Install Drilled Shafts

A total of 22 temporary, 4-foot-diameter drilled shafts may be installed, including 11 immediately west and 11 east of Piers 9 and 10. Drilled shafts are anticipated to be installed by using oscillator rotator equipment with the advanced full-case method. Oscillator rotator equipment is used to excavate a circular hole into the ground. Since the project area likely includes unstable soils, a casing will be used to keep the hole open. The rotator/oscillator method uses hydraulic jacks that use pressure/torque to rotate the casing 20 degrees one direction and then 20 degrees the other direction as it pushes the casing into the substrate. The tip of the first or initial casing has teeth that cut into the earth as it advances. Once one section of casing is installed, another section of casing is connected to the previously installed casing by bolting them together with an impact wrench. This process continues until the design load depth has been reached. Once the casing is fully installed, all the material within it is then removed (with a clamshell bucket or other method) prior to filling the shafts with concrete. The top of the concrete filled shafts or piles are then connected to a platform that will also be formed of concrete. The platform and concrete-filled shafts will be removed after maintenance has been completed.

Note BNSF may use 116 36-inch-diameter pipe piles instead of the drilled shafts. This contingency for 36-inch diameter pipe piles has been included in the estimated total number of 36-inch pipe piles that may be used during this project and analyzed below.

Remove Work Trestles and Shafts

All the temporary work trestle piles will be removed to a depth of 2 ft (0.6 m) below mudline. The piles will be cut by a diver using the Broco Rod cutting method. A diver will make two cuts and then reach/penetrate inside and cut the pipe pile from the inside diameter 2 ft (0.6 m) below mudline. The crane will then be used to snap and lift the pile out of the Canal and off the platform. This operation will continue to the north shoreline until the crane is on land and has removed all the work trestle piles. Drilled shafts will be removed to a depth of 2 ft (0.6 m) below the mudline. The concrete-filled shafts may be cut with a diamond wire saw. In-water 14-inch H-piles or wood/steel posts will be pulled out of the substrate by a crane or vibratory hammer removal as necessary.

During Year 1 12-inch wood piles (12 days) would be extracted while 36-inch steel pipes (10 days), 14-inch H-piles (3 days), and 48-inch drilled shaft casings (88 days) would be installed. During Year 214-inch H-piles (3 days) and 48-inch (6 days) drilled shaft casings would be removed.

Proposed mitigation, monitoring, and reporting measures are described in detail later in this document (please see **Proposed Mitigation** and **Proposed Monitoring and Reporting**).

Description of Marine Mammals in the Area of Specified Activities

Sections 3 and 4 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history, of the potentially affected species. Additional information regarding population trends and threats may be found in NMFS's Stock Assessment Reports (SARs; *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*) and more general information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS's website (*https://www.fisheries.noaa.gov/find-species)*.

Table 2 lists all species or stocks for which take is expected and proposed to be authorized for this action, and summarizes information related to the population or stock, including regulatory status under the MMPA and Endangered Species Act (ESA) and potential biological removal (PBR), where known. For taxonomy, we follow Committee on Taxonomy (2021). PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS's SARs). While no mortality is anticipated or authorized here, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS's stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS's U.S. SARs (*e.g.*, Carretta *et al.,* 2021a). All values presented in Table 2 are the most recent available at the time of publication and are available in the 2020 U.S. Pacific SARs (Carretta *et al.,* 2021a) and 2021 draft Pacific and Alaska SARs (Carretta *et al.,* 2021b, Muto *et al.,* 2021) available online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports*.

Table 2. Species Proposed for Authorized Take

Common name	Scientific name	Stock	ESA/MMPA status; Strategic (Y/N)[a]	Stock abundance (CV, N_{min}, most recent abundance survey)[b]	PBR	Annual M/SI[c]
Order Cetartiodactyla – Cetacea – Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Balaenopteridae (rorquals)						
Minke whale	*Balaenoptera acutorostrata*	California/Oregon/ Washington	-, -, N	915 (0.792, 509, 2018)	4.1	≥ 0.59
Family Delphinidae						
Common Bottlenose Dolphin	*Tursiops truncatus*	California/Oregon/	-, -, N	3,477 (0.696,	19.70	0.82

		Washington offshore		2,048, 2018)		
Long-beaked Common Dolphin	*Delphinus capensis*	California	-, -, N	83,379 (0.216, 69,636, 2018)	668	≥29.7
Family Phocoenidae (porpoises)						
Harbor porpoise	*Phocoena phocoena*	Washington Inland Waters	-, -, N	11,233 (0.37, 8,308, 2015)	66	≥7.2
Order Carnivora – Superfamily Pinnipedia						
Family Otariidae (eared seals and sea lions)						
California Sea Lion	*Zalophus californianus*	United States	-, -, N	257,606 (N/A, 233,515, 2014)	14,011	>320
Steller sea lion	*Eumetopias jubatus monteriensis*	Eastern U.S.	-, -, N	43,201[d] (see SAR, 43,201, 2017)	2,592	113
Family Phocidae (earless seals)						
Harbor seal	*Phoca vitulina*	Washington Northern Inland Waters	-, -, N	1,088 (0.15, UNK, 1999)[e]	NA	10.6

a - ESA status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.
b- NMFS marine mammal stock assessment reports online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region.* CV is coefficient of variation; Nmin is the minimum estimate of stock abundance.
c - These values, found in NMFS's SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (*e.g.*, commercial fisheries, ship strike). Annual mortality/serious injury (M/SI) often cannot be determined precisely and is in some cases presented as a minimum value or range.
d - Best estimate of pup and non-pup counts, which have not been corrected to account for animals at sea during abundance surveys.
e - The abundance estimate for this stock is greater than eight years old and is therefore not considered current. PBR is considered undetermined for this stock, as there is no current minimum abundance estimate for use in calculation. We nevertheless present the most recent abundance estimates, as these represent the best available information for use in this document.

Minke Whale

Minke whales are the most abundant of the rorquals and the population is considered mostly stable globally. In the Pacific, minke whales are usually seen over continental shelves (Brueggeman *et al.,* 1990). In the extreme north, minke whales are believed to be migratory, but in inland waters of Washington and in central California they appear to establish home ranges (Dorsey *et al.,* 1990). They feed on crustaceans, plankton, and small schooling fish (like sandlance) through side lunging.

Minke whales are reported in Washington inland waters year-round, although few are reported in the winter (Calambokidis and Baird 1994). Minke whales are relatively common in the San Juan Islands and Strait of Juan de Fuca (especially around several of the banks in both the central and eastern Strait), but are relatively rare in Puget Sound.

Common Bottlenose Dolphin

Bottlenose dolphins are distributed worldwide in tropical and warm-temperate waters. In many regions, including California, separate coastal and offshore populations are known (Walker 1981; Ross and Cockcroft 1990; Lowther 2006). They have also been documented in offshore waters as far north as about 41°N and they may range into Oregon and Washington waters during warm-water periods. Sighting records off California and Baja California (Lee 1993; Mangels and Gerrodette 1994) suggest that offshore bottlenose dolphins have a continuous distribution in these two regions. There is no apparent seasonality in distribution (Forney and Barlow 1998).

Bottlenose dolphins employ a variety of strategies to feed, including both individual and cooperative hunting and techniques such as herding and charging schools of fish, passive listening, and echolocation. The California/Oregon/Washington offshore stock is the one most likely to occur in Washington waters.

Long-Beaked Common Dolphin

The common dolphin has been observed in the project area. There is debate as to whether short-beaked and long-beaked common dolphins are the same species; we separate the two based on COT (2021). Only long-beaked common dolphins have been spotted in central and south Puget Sound (Orca Network 2020) and this report addresses only the California long-beaked common dolphin stock.

Long-beaked common dolphins typically inhabit warmer temperate and tropical waters and are not usually present north of California; however, sightings of live dolphins and dead stranded individuals have been increasing in the Salish Sea since the early

2000s. Common dolphins were sighted in 2003, 2011-12, and 2016 -17, with strandings occurring in inland waters in 2012 and 2017. These sighting and stranding events are proximal to El Niño periods. Since June 2016, several common dolphins have remained in Puget Sound and group sizes of 5-20 individuals are often reported (Shuster *et al.,* 2018).

Harbor Porpoise

Harbor porpoise occur along the US west coast from southern California to the Bering Sea (Carretta *et al.,* 2020). They rarely occur in waters warmer than 63 degrees Fahrenheit (17 degrees Celsius). The Washington Inland Waters stock is found from Cape Flattery throughout Puget Sound and the Salish Sea region. In southern Puget Sound, harbor porpoise were common in the 1940s, but marine mammal surveys, stranding records since the early 1970s, and harbor porpoise surveys in the early 1990's indicated that harbor porpoise abundance had declined (Carretta *et al.,* 2020). Annual winter aerial surveys conducted by the Washington Department of Fish and Wildlife from 1995 to 2015 revealed an increasing trend in harbor porpoise in Washington inland waters, including the return of harbor porpoise to Puget Sound (Carretta *et al.,* 2020). Seasonal surveys conducted in spring, summer, and fall 2013-2015 in Puget Sound and Hood Canal documented substantial numbers of harbor porpoise in Puget Sound. Observed porpoise numbers were twice as high in spring as in fall or summer, indicating a seasonal shift in distribution.

In most areas, harbor porpoise occur in small groups of just a few individuals. Harbor porpoise must forage nearly continuously to meet their high metabolic needs (Wisniewska *et al.,* 2016). They consume up to 550 small fish (1.2-3.9 inches (3-10 cm); *e.g.,* anchovies) per hour at a nearly 90 percent capture success rate (Wisniewska *et al.,* 2016).

California Sea Lion

California sea lions occur from Vancouver Island, British Columbia, to the southern tip of Baja California. They breed on the offshore islands of southern and central California from May through July (Heath and Perrin, 2008). During the non-breeding season, adult and subadult males and juveniles migrate northward along the coast to central and northern California, Oregon, Washington, and Vancouver Island (Jefferson *et al.,* 1993). They return south the following spring (Heath and Perrin 2008, Lowry and Forney, 2005). Females and some juveniles tend to remain closer to rookeries (Antonelis *et al.,* 1990; Melin *et al.,* 2008).

Pupping occurs primarily on the California Channel Islands from late May until the end of June (Peterson and Bartholomew 1967). Weaning and mating occur in late spring and summer during the peak upwelling period (Bograd *et al.,* 2009). After the mating season, adult males migrate northward to feeding areas as far away as the Gulf of Alaska (Lowry *et al.,* 1992), and they remain away until spring (March-May), when they migrate back. Adult females generally remain south of Monterey Bay, California throughout the year, feeding in coastal waters in the summer and offshore waters in the winter, alternating between foraging and nursing their pups on shore until the next pupping/breeding season (Melin and DeLong, 2000; Melin *et al.,* 2008).

California sea lions regularly occur on rocks, buoys and other structures. Occurrence in the project area is expected to be common. The California sea lion is the most frequently sighted otariid found in Washington waters. Some 3,000 to 5,000 animals are estimated to move into Pacific Northwest waters of Washington and British Columbia during the fall (September) and remain until the late spring (May) when most return to breeding rookeries in California and Mexico (Jeffries *et al.,* 2000). Peak counts of over 1,000 animals have been made in Puget Sound (Jeffries *et al.,* 2000).

Steller Sea Lion

Steller sea lions range along the North Pacific Rim from northern Japan to California, with centers of abundance and distribution in the Gulf of Alaska and Aleutian Islands. Large numbers of individuals widely disperse when not breeding (late May to early July) to access seasonally important prey resources (Muto *et al.,* 2019). Steller sea lions were subsequently partitioned into the western and eastern Distinct Population Segments (DPSs; western and eastern stocks) in 1997 (62 FR 24345, May 5, 1997) when they were listed under the ESA. The western DPS breeds on rookeries located west of 144° W in Alaska and Russia, whereas the eastern DPS breeds on rookeries in southeast Alaska through California. The eastern DPS was delisted from the ESA in 2013.

The eastern DPS and MMPA stock is the only population of Steller's sea lions thought to occur in the project area. In Washington waters, numbers decline during the summer months, which correspond to the breeding season at Oregon and British Columbia rookeries (approximately late May to early June) and peak during the fall and winter months. Steller sea lion abundances vary seasonally with a minimum estimate of 1,000 to 2,000 individuals present or passing through the Strait of Juan de Fuca in fall and winter months (Jeffries *et al.,* 2000).

Harbor Seal

Harbor seals are found from Baja California to the eastern Aleutian Islands of Alaska (Harvey and Goley, 2011). The animals in the project area are part of the Southern Puget Sound stock. Harbor seals are the most common marine mammal species observed in the project area and are the only one that breeds and remains in the inland marine waters of Washington year-round (Calambokidis and Baird, 1994).

Harbor seals are central-place foragers (Orians and Pearson, 1979) and tend to exhibit strong site fidelity within season and across years, generally forage close to haulout sites, and repeatedly visit specific foraging areas (Grigg *et al.,* 2012; Suryan and

Harvey, 1998; Thompson *et al.,* 1998). Depth, bottom relief, and prey abundance also influence foraging location (Grigg *et al.,* 2012).

Harbor seals molt from May through June. Peak numbers of harbor seals haul out during late May to early June, which coincides with the peak molt. During both pupping and molting seasons, the number of seals and the length of time hauled out per day increase, from an average of 7 hours per day to 10-12 hours (Harvey and Goley, 2011; Huber *et al.,* 2001; Stewart and Yochem, 1994).

Harbor seals tend to forage at night and haul out during the day with a peak in the afternoon between 1 p.m. and 4 p.m. (Grigg *et al.,* 2012; London *et al.,* 2001; Stewart and Yochem, 1994; Yochem *et al.,* 1987). Tide levels affect the maximum number of seals hauled out, with the largest number of seals hauled out at low tide, but time of day and season have the greatest influence on haul out behavior (Manugian *et al.,* 2017; Patterson and Acevedo-Gutiérrez, 2008; Stewart and Yochem, 1994).

As indicated above, all 7 species (with 7 managed stocks) in Table 2 temporally and spatially co-occur with the activity to the degree that take is reasonably likely to occur, and we have proposed authorizing it.

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g.*, Richardson *et al.*, 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.,* (2007) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e*., low-frequency cetaceans). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibel (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.,* (2007) retained. Marine mammal hearing groups and their associated hearing ranges are provided in Table 3.

Table 3. Marine Mammal Hearing Groups (NMFS, 2018)

Hearing Group	Generalized Hearing Range*
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
High-frequency (HF) cetaceans (true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*)	275 Hz to 160 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz

* Represents the generalized hearing range for the entire group as a composite (*i.e.,* all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall *et al.,* 2007) and PW pinniped (approximation).

The pinniped functional hearing group was modified from Southall *et al.,* (2007) on the basis of data indicating that phocid species have consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä *et al*., 2006; Kastelein *et al*., 2009; Reichmuth and Holt, 2013).

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information. Seven marine mammal species (four cetacean and three pinniped (two otariid and one phocid) species) have the reasonable potential to co-occur with the proposed survey activities. Please refer to Table 3. Minke whales are low frequency cetaceans, long-beaked common dolphins and common bottlenose dolphins are mid-frequency cetaceans, harbor porpoises are classified as high-frequency cetaceans, Harbor seals are in the phocid group, and Steller sea lions and California sea lions are otariids.

Potential Effects of Specified Activities on Marine Mammals and their Habitat

This section includes a summary and discussion of the ways that components of the specified activity may impact marine mammals and their habitat. The **Estimated Take** section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by this activity. The **Negligible Impact Analysis and Determination** section considers the content of this section, the **Estimated Take** section, and the **Proposed Mitigation** section, to draw conclusions regarding the likely impacts of these activities on the reproductive success or survivorship of individuals and how those impacts on individuals are likely to impact marine mammal species or stocks.

Acoustic effects on marine mammals during the specified activity can occur from vibratory and impact pile driving and drilling, cutting, and clipping. The effects of underwater noise from BNSF's proposed activities have the potential to result in Level A and Level B harassment of marine mammals in the action area.

Description of Sound Sources

The marine soundscape is comprised of both ambient and anthropogenic sounds. Ambient sound is defined as the all-encompassing sound in a given place and is usually a composite of sound from many sources both near and far. The sound level of an area is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.*, waves, wind, precipitation, earthquakes, ice, atmospheric sound), biological (*e.g.*, sounds produced by marine mammals, fish, and invertebrates), and anthropogenic sound (*e.g.*, vessels, dredging, aircraft, construction).

The sum of the various natural and anthropogenic sound sources at any given location and time—which comprise "ambient" or "background" sound—depends not only on the source levels (as determined by current weather conditions and levels of biological and shipping activity) but also on the ability of sound to propagate through the environment. In turn, sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor, and is frequency-dependent. As a result of the dependence on a large number of varying factors, ambient sound levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10-20 dB from day to day (Richardson *et al.,* 1995). The result is that, depending on the source type and its intensity, sound from the specified activity may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals.

In-water construction activities associated with the project would include impact pile driving, vibratory pile driving, vibratory pile removal, drilling by oscillator rotators, cutting with a wire saw, and clipping of wood timbers. The sounds produced by these activities fall into one of two general sound types: Impulsive and non-impulsive. Impulsive sounds (*e.g.*, explosions, gunshots, sonic booms, impact pile driving) are typically transient, brief (less than 1 second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (ANSI 1986; NIOSH 1998; ANSI 2005; NMFS 2018a). Non-impulsive sounds (*e.g.* aircraft, machinery operations such as drilling or dredging, vibratory pile driving, clipping, cutting, and active sonar systems) can be broadband, narrowband or tonal, brief or prolonged (continuous or intermittent), and typically do not have the high peak sound pressure with raid rise/decay time that impulsive sounds do (ANSI 1995; NIOSH 1998; NMFS 2018). The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (*e.g.*, Ward 1997 in Southall *et al.,* 2007).

Two types of pile hammers would be used on this project: Impact and vibratory. Impact hammers operate by repeatedly dropping a heavy piston onto a pile to drive the pile into the substrate. Sound generated by impact hammers is characterized by rapid rise times and high peak levels, a potentially injurious combination (Hastings and Popper 2005). Vibratory hammers install piles by vibrating them and allowing the weight of the hammer to push them into the sediment. Vibratory hammers produce significantly less sound than impact hammers. Peak sound pressure levels (SPLs) may be 180 dB or greater, but are generally 10 to 20 dB lower than SPLs generated during impact pile driving of the same-sized pile (Oestman *et al.,* 2009). Rise time is slower, reducing the probability and severity of injury, and sound energy is distributed over a greater amount of time (Nedwell and Edwards 2002; Carlson *et al.,* 2005). Hydraulic pile clippers are placed over the pile and lowered to the mudline where they use opposing blades in a horizontal motion to cut the existing wood piles. Diamond wire cutting is the process of using wire of various diameters and lengths, impregnated with diamond dust of various sizes, to cut through drilled shaft casing.

The likely or possible impacts of BNSF's proposed activity on marine mammals could involve both non-acoustic and acoustic stressors. Potential non-acoustic stressors could result from the physical presence of the equipment and personnel; however, any impacts to marine mammals are expected to primarily be acoustic in nature. Acoustic stressors include effects of heavy equipment operation during pile installation and removal.

Acoustic Impacts

The introduction of anthropogenic noise into the aquatic environment from pile driving and removal, drilling, cutting and clipping is the primary means by which marine mammals may be harassed from BNSF's specified activity. In general, animals exposed to natural or anthropogenic sound may experience physical and psychological effects, ranging in magnitude from none to severe (Southall *et al.,* 2007). In general, exposure to pile driving and removal noise has the potential to result in auditory threshold shifts and behavioral reactions (*e.g.*, avoidance, temporary cessation of foraging and vocalizing, changes in dive behavior). Exposure to anthropogenic noise can also lead to non-observable physiological responses such an increase in stress hormones. Additional noise in a marine mammal's habitat can mask acoustic cues used by marine mammals to carry out daily functions such as communication and predator and prey detection. The effects of drilling, cutting, pile driving and removal noise on marine mammals are dependent on several factors, including, but not limited to, sound type (*e.g.*, impulsive vs. non-impulsive), the species, age and sex class (*e.g.*, adult male vs. mom with calf), duration of exposure, the distance between the pile and the animal, received levels, behavior at time of exposure, and previous history with exposure (Wartzok *et al.,* 2004; Southall *et al.,* 2007). Here we discuss physical auditory effects (threshold shifts) followed by behavioral effects and potential impacts on habitat.

NMFS defines a noise-induced threshold shift (TS) as a change, usually an increase, in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018). The amount of threshold shift is customarily expressed in dB. A TS can be permanent or temporary. As described in NMFS (2018), there are numerous factors to consider when examining the consequence of TS, including, but not limited to, the signal temporal pattern (*e.g.*, impulsive or non-impulsive), likelihood an individual would be exposed for a long enough duration or to a high enough level to induce a TS, the magnitude of the TS, time to recovery (seconds to minutes or hours to days), the frequency range of the exposure (*i.e.*, spectral content), the hearing and vocalization frequency range of the exposed species relative to the signal's frequency spectrum (*i.e.*, how an animal uses sound within the frequency band of the signal; *e.g.*, Kastelein *et al.,* 2014), and the overlap between the animal and the source (*e.g.*, spatial, temporal, and spectral).

Permanent Threshold Shift (PTS)—NMFS defines PTS as a permanent, irreversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018). Available data from humans and other terrestrial mammals indicate that a 40 dB threshold shift approximates PTS onset (see Ward *et al.,* 1958, 1959; Ward 1960; Kryter *et al.,* 1966; Miller 1974; Ahroon *et al.,* 1996; Henderson *et al.,* 2008). PTS levels for marine mammals are estimates, as with the exception of a single study unintentionally inducing PTS in a harbor seal (Kastak *et al.,* 2008), there are no empirical data measuring PTS in marine mammals largely due to the fact that, for various ethical reasons, experiments involving anthropogenic noise exposure at levels inducing PTS are not typically pursued or authorized (NMFS 2018).

Temporary Threshold Shift (TTS)—TTS is a temporary, reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018). Based on data from cetacean TTS measurements (see Southall *et al.,* 2007), a TTS of 6 dB is considered the minimum threshold shift clearly larger than any day-to-day or session-to-session variation in a subject's normal hearing ability (Schlundt *et al.,* 2000; Finneran *et al.,* 2000, 2002). As described in Finneran (2015), marine mammal studies have shown the amount of TTS increases with cumulative sound exposure level (SELcum) in an accelerating fashion: At low exposures with lower SELcum, the amount of TTS is typically small and the growth curves have shallow slopes. At exposures with higher SELcum, the growth curves become steeper and approach linear relationships with the noise SEL.

Depending on the degree (elevation of threshold in dB), duration (*i.e.*, recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious (similar to those discussed in auditory masking, below). For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that takes place during a time when the animal is traveling through the open ocean, where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical for successful mother/calf interactions could have more serious impacts. We note that reduced hearing sensitivity as a simple function of aging has been observed in marine mammals, as well as humans and other taxa (Southall *et al.,* 2007), so we can infer that strategies exist for coping with this condition to some degree, though likely not without cost.

Currently, TTS data only exist for four species of cetaceans (bottlenose dolphin, beluga whale (*Delphinapterus leucas*), harbor porpoise, and Yangtze finless porpoise (*Neophocoena asiaeorientalis*)) and five species of pinnipeds exposed to a limited number of sound sources (*i.e.*, mostly tones and octave-band noise) in laboratory settings (Finneran 2015). TTS was not observed in trained spotted (*Phoca largha*) and ringed (*Pusa hispida*) seals exposed to impulsive noise at levels matching previous predictions of TTS onset (Reichmuth *et al.,* 2016). In general, harbor seals and harbor porpoises have a lower TTS onset than other measured pinniped or cetacean species (Finneran 2015). Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species. No data are available on noise-induced hearing loss for mysticetes. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Southall *et al.,* (2007), Finneran and Jenkins (2012), Finneran (2015), and Table 5 in NMFS (2018). Installing piles requires a combination of impact pile driving and vibratory pile driving. For this project, these activities would not occur at the same time and there would be pauses in activities producing the sound during each day. Given these pauses and that many marine mammals are likely moving through the ensonified area and not remaining for extended periods of time, the potential for TS declines.

Behavioral Harassment—Exposure to noise from pile driving and removal also has the potential to behaviorally disturb marine mammals. Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the stock or population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g.*, Lusseau & Bejder 2007; Weilgart 2007; NRC 2005).

Disturbance may result in changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where sound sources are located. Pinnipeds may increase their haul out time, possibly to avoid in-water disturbance (Thorson and Reyff 2006). Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (*e.g.*, species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g.*, Richardson *et al.,* 1995; Wartzok *et al.,* 2003; Southall *et al.,* 2007; Weilgart 2007). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison *et al.,* 2012), and can vary depending on characteristics associated with the sound source (*e.g.*, whether it is moving or stationary, number of sources, distance from the source). In general, pinnipeds seem more tolerant of, or at least habituate more quickly to, potentially disturbing underwater sound than do cetaceans, and generally seem to be less responsive to exposure to industrial sound than most cetaceans. Please see Appendices B-C of Southall *et al.,* (2007) for a review of studies involving marine mammal behavioral responses to sound.

Disruption of feeding behavior can be difficult to correlate with anthropogenic sound exposure, so it is usually inferred by observed displacement from known foraging areas, the appearance of secondary indicators (*e.g.*, bubble nets or sediment plumes), or changes in dive behavior. As for other types of behavioral response, the frequency, duration, and temporal pattern of signal presentation, as well as differences in species sensitivity, are likely contributing factors to differences in response in any given circumstance (*e.g.*, Croll *et al.,* 2001; Nowacek *et al.,* 2004; Madsen *et al.,* 2006; Yazvenko *et al.,* 2007). A determination of whether foraging disruptions incur fitness consequences would require information on or estimates of the energetic requirements of the affected individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal.

Stress responses – An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (*e.g.*, Seyle 1950; Moberg 2000). In many cases, an animal's first and sometimes most economical (in terms of energetic costs) response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

Neuroendocrine stress responses often involve the hypothalamus-pituitary-adrenal system. Virtually all neuroendocrine functions that are affected by stress – including immune competence, reproduction, metabolism, and behavior – are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance (*e.g.*, Moberg 1987; Blecha 2000). Increases in the circulation of glucocorticoids are also equated with stress (Romano *et al.*, 2004).

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and "distress" is the cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other functions. This state of distress will last until the animal replenishes its energetic reserves sufficient to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments and for both laboratory and free-ranging animals (*e.g.*, Holberton *et al.*, 1996; Hood *et al.*, 1998; Jessop *et al.*, 2003; Krausman *et al.*, 2004; Lankford *et al.*, 2005). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker 2000; Romano *et al.*, 2002b) and, more rarely, studied in wild populations (*e.g.*, Romano *et al.*, 2002a). For example, Rolland *et al.,* (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as "distress." In addition, any animal experiencing TTS would likely also experience stress responses (NRC, 2003), however distress is an unlikely result of this project based on observations of marine mammals during previous, similar projects in the area.

Masking—Sound can disrupt behavior through masking, or interfering with, an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g.*, those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al.,* 1995). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may occur whether the sound is natural (*e.g.*, snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g.*, pile driving, shipping, sonar, seismic exploration) in origin. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g.*, signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g.*, sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age or TTS hearing loss), and existing ambient noise and propagation conditions. Masking of natural sounds can result when human activities produce high levels of background sound at frequencies important to marine mammals. Conversely, if the background level of underwater sound is high (*e.g.* on a day with strong wind and high waves), an anthropogenic sound source would not be detectable as far away as would be possible under quieter conditions and would itself be masked.

Airborne Acoustic Effects—Pinnipeds that occur near the project site could be exposed to airborne sounds associated with drilling, cutting, clipping, pile driving and removal that have the potential to cause behavioral harassment, depending on their distance from the activities. Cetaceans are not expected to be exposed to airborne sounds that would result in harassment as defined under the MMPA.

Airborne noise would primarily be an issue for pinnipeds that are swimming or hauled out near the project site within the range of noise levels exceeding the acoustic thresholds. We recognize that pinnipeds in the water could be exposed to airborne sound that may result in behavioral harassment when looking with their heads above water. Most likely, airborne sound would cause behavioral responses similar to those discussed above in relation to underwater sound. For instance, anthropogenic sound could cause hauled-out pinnipeds to exhibit changes in their normal behavior, such as reduction in vocalizations, or cause them to temporarily abandon the area and move further from the source. However, these animals would previously have been 'taken' because of exposure to underwater sound above the behavioral harassment thresholds, which are, in all cases, larger than those associated with airborne sound. As described above there are no regular haulouts in direct line of sight of the project area. Thus, the behavioral harassment of these animals is already accounted for in these estimates of potential take. Therefore, authorization of incidental take resulting from airborne sound for pinnipeds is not warranted, and airborne sound is not discussed further here.

Marine Mammal Habitat Effects

BNSF's construction activities could have localized, temporary impacts on marine mammal habitat by increasing in-water sound pressure levels and slightly decreasing water quality. Construction activities are of short duration and would likely have temporary impacts on marine mammal habitat through increases in underwater sound. Increased noise levels may affect acoustic habitat (see masking discussion above) and adversely affect marine mammal prey in the vicinity of the project area (see discussion below). During drilling, cutting, clipping, impact and vibratory pile driving, elevated levels of underwater noise would ensonify a portion of the Ship Canal and potentially radiate some distance into Shilshole Bay depending on the sound source where both fish and mammals may occur and could affect foraging success. Additionally, marine mammals may avoid the area during construction, however, displacement due to noise is expected to be temporary and is not expected to result in long-term effects to the individuals or populations.

A temporary and localized increase in turbidity near the seafloor would occur in the immediate area surrounding the area where piles or shafts are installed (and removed in the case of the temporary piles). The sediments on the sea floor will be disturbed during pile driving and shaft drilling; however, suspension will be brief and localized and is unlikely to measurably affect marine mammals or their prey in the area. In general, turbidity associated with pile installation is localized to about a 25-foot (7.6-meter) radius around the pile (Everitt *et al.,* 1980). Cetaceans are not expected to be close enough to the pile driving areas to experience effects of turbidity, and any pinnipeds could avoid localized areas of turbidity. Therefore, we expect the impact from increased turbidity levels to be discountable to marine mammals and do not discuss it further.

In-Water Construction Effects on Potential Foraging Habitat

The proposed activities would not result in permanent impacts to habitats used directly by marine mammals except for the actual footprint of the project. The total seafloor area affected by pile installation and removal is a very small area compared to the vast foraging area available to marine mammals in Puget Sound.

Avoidance by potential prey (*i.e.*, fish) of the immediate area due to the temporary loss of this foraging habitat is also possible. The duration of fish avoidance of this area after pile driving stops is unknown, but we anticipate a rapid return to normal recruitment, distribution and behavior. Any behavioral avoidance by fish of the disturbed area would still leave large areas of fish and marine mammal foraging habitat in the nearby vicinity in Puget Sound.

Effects on Potential Prey

Sound may affect marine mammals through impacts on the abundance, behavior, or distribution of prey species (*e.g.,* fishes). Marine mammal prey varies by species, season, and location. Here, we describe studies regarding the effects of noise on known marine mammal prey.

Fish utilize the soundscape and components of sound in their environment to perform important functions such as foraging, predator avoidance, mating, and spawning (*e.g.*, Zelick *et al.*, 1999; Fay, 2009). Depending on their hearing anatomy and peripheral sensory structures, which vary among species, fishes hear sounds using pressure and particle motion sensitivity capabilities and detect the motion of surrounding water (Fay *et al.*, 2008). The potential effects of noise on fishes depends on the overlapping frequency range, distance from the sound source, water depth of exposure, and species-specific hearing sensitivity, anatomy, and physiology. Key impacts to fishes may include behavioral responses, hearing damage, barotrauma (pressure-related injuries), and mortality.

Fish react to sounds which are especially strong and/or intermittent low-frequency sounds, and behavioral responses such as flight or avoidance are the most likely effects. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. The reaction of fish to noise depends on the physiological state of the fish, past exposures, motivation (*e.g.*, feeding, spawning, migration), and other environmental factors. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented effects of pile driving on fish, although several are based on studies in support of large, multiyear bridge construction projects (*e.g.*, Scholik and Yan, 2001, 2002; Popper and

Hastings, 2009). Several studies have demonstrated that impulse sounds might affect the distribution and behavior of some fishes, potentially impacting foraging opportunities or increasing energetic costs (*e.g*., Fewtrell and McCauley, 2012; Pearson *et al.*, 1992; Skalski *et al.*, 1992; Santulli *et al.*, 1999; Paxton *et al.*, 2017). However, some studies have shown no or slight reaction to impulse sounds (*e.g*., Pena *et al.*, 2013; Wardle *et al.*, 2001; Jorgenson and Gyselman, 2009; Cott *et al.*, 2012).

SPLs of sufficient strength have been known to cause injury to fish and fish mortality. However, in most fish species, hair cells in the ear continuously regenerate and loss of auditory function likely is restored when damaged cells are replaced with new cells. Halvorsen *et al.,* (2012a) showed that a TTS of 4-6 dB was recoverable within 24 hours for one species. Impacts would be most severe when the individual fish is close to the source and when the duration of exposure is long. Injury caused by barotrauma can range from slight to severe and can cause death, and is most likely for fish with swim bladders. Barotrauma injuries have been documented during controlled exposure to impact pile driving (Halvorsen *et al.*, 2012b; Casper *et al.*, 2013).

The most likely impact to fish from drilling, cutting, clipping, and pile driving activities at the project areas would be temporary behavioral avoidance of the area. The duration of fish avoidance of an area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated.

The area impacted by the project is relatively small compared to the available habitat in Shilshole Bay and larger Puget Sound. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity. Additionally, as noted previously, BNSF will adhere to the USACE's in-water work window restrictions on pile extraction and installation (July 16 to January 15) to reduce potential effects to salmonids, including juvenile ESA-listed salmonids. As described in the preceding, the potential for BNSF's construction to affect the availability of prey to marine mammals or to meaningfully impact the quality of physical or acoustic habitat is considered to be insignificant.

Estimated Take

This section provides an estimate of the number of incidental takes proposed for authorization through this IHA, which will inform both NMFS' consideration of "small numbers" and the negligible impact determination.

Harassment is the only type of take expected to result from these activities. Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines "harassment" as any act of pursuit, torment, or annoyance, which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

Authorized takes would primarily be by Level B harassment, as use of the acoustic sources for pile installation and extraction has the potential to result in disruption of behavioral patterns for individual marine mammals. There is also some potential for auditory injury (Level A harassment) to result, primarily for harbor seals, because predicted auditory injury zones are large. Auditory injury is unlikely to occur for low-frequency cetaceans, mid-frequency cetaceans, high-frequency cetaceans, and otariids. The proposed mitigation and monitoring measures are expected to minimize the severity of the taking to the extent practicable.

As described previously, no mortality is anticipated or proposed to be authorized for this activity. Below we describe how the take is estimated.

Generally speaking, we estimate take by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and, (4) the number of days of activities. We note that while these basic factors can contribute to a basic calculation to provide an initial prediction of takes, additional information that can qualitatively inform take estimates is also sometimes available (*e.g.,* previous monitoring results or average group size). Below, we describe the factors considered here in more detail and present the proposed take estimate.

Acoustic Thresholds

NMFS recommends the use of acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

Level B Harassment for non-explosive sources – Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source (*e.g.*, frequency, predictability, duty cycle), the environment (*e.g.*, bathymetry), and the receiving animals (hearing, motivation, experience, demography, behavioral context) and can be difficult to predict (Southall *et al.,* 2007, Ellison *et al.*, 2012). Based on what the available science indicates and the practical need to use a threshold based on a factor that is both predictable and measurable for most activities, NMFS uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS predicts that marine mammals are likely to be behaviorally harassed in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 μPa (rms) for continuous (*e.g.,* vibratory pile-driving, drilling) and above 160 dB re 1 μPa (rms) for non-explosive impulsive (*e.g.*, seismic airguns) or intermittent (*e.g.*, scientific sonar) sources.

BNSF's proposed activity includes the use of continuous (vibratory pile driving and removal, oscillator rotator equipment, wire saw cutting, clipping) and impulsive (impact pile driving) equipment, and therefore both the 120- and 160-dB re 1 μPa (rms) thresholds are applicable.

Level A harassment for non-explosive sources - NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). BNSF's proposed activity includes the use of impulsive (impact pile driving) and non-impulsive (vibratory pile driving) sources.

These thresholds are provided in the table below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2018 Technical Guidance, which may be accessed at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance*.

Table 4. Thresholds Identifying the Onset of Permanent Threshold Shift

	PTS Onset Acoustic Thresholds* (Received Level)	
Hearing Group	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	*Cell 1* $L_{pk,flat}$: 219 dB $L_{E,LF,24h}$: 183 dB	*Cell 2* $L_{E,LF,24h}$: 199 dB
Mid-Frequency (MF) Cetaceans	*Cell 3* $L_{pk,flat}$: 230 dB $L_{E,MF,24h}$: 185 dB	*Cell 4* $L_{E,MF,24h}$: 198 dB
High-Frequency (HF) Cetaceans	*Cell 5* $L_{pk,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	*Cell 6* $L_{E,HF,24h}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	*Cell 7* $L_{pk,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	*Cell 8* $L_{E,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	*Cell 9* $L_{pk,flat}$: 232 dB	*Cell 10* $L_{E,OW,24h}$: 219 dB

	$L_{E,OW,24h}$: 203 dB	
* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered. Note: Peak sound pressure (L_{pk}) has a reference value of 1 μPa, and cumulative sound exposure level (L_E) has a reference value of 1μPa²s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (*i.e.*, varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.		

Ensonified Area

Here, we describe operational and environmental parameters of the activity that will feed into identifying the area ensonified above the acoustic thresholds, which include source levels and transmission loss coefficient.

The following pile sizes and installation/extraction methods were analyzed:

- 36-inch steel pipe pile, impact installation, with 5 dB bubble curtain source level reduction under two installation scenarios (1 pile driver or 2 concurrent pile drivers);
- 48-inch steel pipe pile, oscillator installation (drilled shaft);
- 48-inch steel pipe pile, diamond wire saw cutting;
- 14-inch steel H-pile, vibratory installation/extraction;
- 12-inch timber pile, vibratory installation/extraction; and
- 12-inch timber pile, pile clipper extraction.

Impact pile driver installation of 36-inch steel pipe piles analyzed a worst-case scenario consisting of two crews driving 36-inch steel pipe piles simultaneously (Scenario 2) in order to provide maximum flexibility should multiple crews become necessary during construction. It is likely, however, that only one crew will operate at one time (Scenario 1). Based on NMFS guidance, decibel addition is not considered in the 36-inch steel pipe pile impact analysis since during impact hammering or other impulsive sources, it is unlikely that the two hammers would strike at the same exact instant (or within the 0.1 second average pulse duration). Therefore, the sound source levels will not be adjusted regardless of the distance between the hammers and each source will be analyzed separately.

Vibratory pile driving of 14-inch H-piles, and vibratory and pile clipper extraction of 12-inch timber piles (residential structures demolition) were analyzed in the event these methods become necessary (if, for instance, crane weight alone cannot seat the 14-inch H-piles for the turbidity screen installation or crane torque alone cannot extract timber piles by direct pulling/twisting).

This analysis uses in-water source sound levels for vibratory and impact pile driving from Washington State Department of Transportation Biological Assessment Manual (WDSOT 2020), and California Department of Transportation Division (Caltrans 2015). Analysis of drilled shaft installation used sound source data came from (*HDR, 2011*. Diamond wire saw cutting and hydraulic pile clipper cutting came from the Navy (2019). Source sound levels for each analysis were measured at 10m from the source and based on other projects with the same pile type and size, installation/extraction technique, and similar substrate if no project site-specific information is available.

In cases where multiple sources were provided from the above references, the following methodology was used to select in-water source sound levels to generate a proxy:

1. Select first by corresponding pile size and type;

2. Eliminate those that do not have substrates similar to the project site substrate (*i.e.* sandy silt intermixed with gravels and riprap); and

3. Of the remaining, select highest source sound level to be conservative.

All piles driven and/or proofed with an impact hammer would use a bubble curtain. It is estimated that use of a bubble curtain would result in a minimum of a 5-dB reduction in underwater sound levels during 36-inch pipe pile driving, and this reduction has been included in the estimate to account for a reasonably achievable reduction in sound during underwater construction activity. Source sound levels are summarized in Table 5.

Table 5. In-Water Sound Source Levels

Pile Size	Pile Type	Source	Construction Method	dB Peak	dB RMS	dB Single-Strike SEL
36 inch	Steel pipe	Caltrans, 2015. 36-inch steel pipe pile Table I.2-1	Impact	208	190	180
14 inch	H-pile	Caltrans, 2015. 12-inch steel H-pile proxy Table I.2-2.	Vibratory	—	150	—
12 inch	Timber Pile	Greenbusch Group, 2018. 12-inch timber pile	Vibratory	—	152	—
12 inch	Timber Pile	NAVFAC SW 2020 Compendium. 13-inch round polycarbonate pile	Hydraulic Pile Clipper	—	154	—
48-inch	Steel Shaft	HDR Alaska, Inc., 2011. 144-inch steel shaft proxy	Oscillator	—	143.8	—
48-inch	Steel-encased Concrete Shaft	NAVFAC SW 2020 Compendium. 66-inch steel encased concrete-filled caisson proxy	Diamond bladed wire saw	—	161.5	—

Transmission loss (TL), expressed as decibels, is the reduction in a specified level between two specified points R1, R2 that are within an underwater acoustic field. By convention, R1 is chosen to be closer to the source of sound than R2, such that transmission loss is usually a positive quantity. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. The general formula for underwater TL is:

$TL = B * Log_{10} (R_2/R_1)$,

where

TL = transmission loss in dB

B = transmission loss coefficient

R_1 = distance from source to distance at which the level is estimated (typically 10-m for pile driving)

R_2 = distance from source to the isopleth associated with the applicable acoustic threshold

Absent site-specific acoustical monitoring with differing measured transmission loss, a practical spreading value of 15 is used as the transmission loss coefficient in the above formula. Site-specific transmission loss data for BNSF bridge site is not available, therefore the default coefficient of 15 is used to determine the distances to the Level A and Level B harassment thresholds.

When the NMFS Technical Guidance (2016) was published, in recognition of the fact that ensonified area/volume could be more technically challenging to predict because of the duration component in the new thresholds, we developed a User Spreadsheet that includes tools to help predict a simple isopleth that can be used in conjunction with marine mammal density or occurrence to help predict takes. We note that because of some of the assumptions included in the methods used for these tools, we anticipate that isopleths produced are typically going to be overestimates of some degree, which may result in some degree of overestimate of Level A harassment take. However, these tools offer the best way to predict appropriate isopleths when more sophisticated 3D modeling methods are not available, and NMFS continues to develop ways to quantitatively refine these tools, and will qualitatively address the output where appropriate. For stationary sources, NMFS User Spreadsheet predicts the distance at which, if a marine mammal remained at that distance the whole duration of the activity, it would incur PTS. Inputs used in the User Spreadsheet are shown in Table 6 and the resulting isopleths are reported below in Table 7.

Table 6. User Spreadsheet Input Parameters Used for Calculating Level A Harassment Isopleths

	36-inch steel (scenario 1)	36-inch steel - 2 concurrent (Scenario 2)	14-inch. steel H-pile vibratory install	12-inch timber vibratory extraction	48-inch steel Oscillator	48-inch Wire saw cutting	12-inch timber clipper cutting
Spreadsheet Tab Used	E.1) Impact pile driving	E.1) Impact pile driving	A.1) Vibratory pile driving	A.1) Vibratory pile driving	A) stationary source (non-impulsive, continuous)	A) stationary source (non-impulsive, continuous)	A) stationary source (non-impulsive, continuous)
Source Level (Single Strike/shot SEL) and Peak or RMS	175 SEL/ 203 Peak	175 SEL/ 203 Peak	150 RMS	152 RMS	143.8 RMS	161.5 RMS	154 RMS
Weighting Factor Adjustment (kHz)	2	2	2.5	2.5	2.5	2.5	2.5
a) Number of strikes per pile	1000	1000					
Number piles or shafts per day	6	12	8	10	0.25	4	20
Duration for single pile (min)			30	15	1920	60	4

Note transmission loss coefficient for all sources is 15 and all source level values quoted are at 10m distance.

Table 7. Calculated Distances to Level A and Level B Harassment Isopleths

Pile Type, Size, and Pile Driving Method	Level A Zone (meters)					Level B Harassment Zone (meters)
	LF cetacean	MF cetacean	HF cetacean	Phocid	Otariid	
Scenario 1. 36-inch Steel PipeImpact Drive (Year 1)	966	34	1,150	517	38	464
Scenario 2. 36-inch Steel PipeImpact Drive (Year 1)	1,533	55	1,826	820	60	464
14-inch H-Pile Vibratory (Year 1, Year 2)	3	1	5	2	1	1,000
12-inch Timber Vibratory (Year 1)	3	1	5	2	1	1,359
48-inch Drilled Shaft Oscillatory Installation (Year 1)	0.2	0	0.2	0.1	0	386
48-inch Concrete-lined Steel Shaft Diamond Wire Saw Removal Year 2)	1.9	0.2	2.7	1.1	0.1	5,843
12-inch Timber Pile Clipper Year 1)	0.6	0	0.6	0.3	0	1,848

Marine Mammal Occurrence and Take Calculation and Estimation

In this section we provide the information about the presence, density, or group dynamics of marine mammals and how it is brought together to produce a quantitative take estimate.

Take estimates were calculated using a combination of best available data. Best available density data was for the most part from the U.S. Department of the Navy's Marine Species Density Database Phase III for the Northwest Training and Testing Study Area (Navy 2019) which includes seasonal density estimates: Winter (Dec-Feb), Spring (Mar-May), Summer (Jun-Aug), Fall (Sep-Nov). The project will not work in-water in the Spring as that season is outside the July 16 – February 15 in-water work season. The most conservative (highest density) seasonal estimate from the remaining three seasons was used where seasonal overlap exists and densities differ across seasons. Estimated take was calculated using density estimates multiplied by the area of each Level B harassment zone for each pile type multiplied by the number of days of in-water activity for each pile type. In some instances and where noted, observation-based data from WSDOT's Seattle Multimodal Project at Colman Dock Season Three Marine Mammal Monitoring Report (WSDOT 2020a) or other observational data was used instead of US Navy data when Navy density data was zero or extremely low.

BNSF proposes to work in-water for 113 days in Year 1 and 9 days in Year 2, or approximately 5.5 months assuming a 5-day work week for 23 weeks in Year 1 and a half a month assuming a 5-day work week for 2 weeks in Year 2,

Minke Whale

The estimated take was calculated as described above using the Navy's density data which resulted in zero takes of minke whale for both Year 1 and Year 2 as shown in Table 8. Therefore, as described above, we looked at other observational data. The WSDOT Seattle Multimodal Project at Colman Dock Year 3 IHA Monitoring Report observed minke whale presence indicates sightings of a single minke whale over 7 months (WSDOT 2020a). Given this information, BNSF and NMFS conservatively assumed that up to one whale per month could be taken by harassment.

A shutdown zone at the full distance of the level A harassment isopleths (≤ 1533 m) will be applied to avoid take by Level A harassment.

The 113 days of work in Year 1 and 9 days in Year 2, equates to 5.5 months × 1 minke whale/month = 6 encounters with minke whales in Year 1 and 0.5 months x 1 Minke whale/month = 1 whale in Year 2. Therefore, BNSF has requested and NMFS proposes 6 takes by Level B harassment in Year 1 and 1 take by Level B harassment in year in Year 2.

Table 8. Calculated Take of Minke Whale

Activity	Species Density (animals/km^2)	Level A Area (km^2)	Level B Area (km^2)	Length of Activity (days)	Year 1 Estimated Take A	Year 1 Estimated Take B	Year 2 Estimated Take A	Year 2 Estimated Take B
Impact 36-inch Steel Pipe Pile (2 Concurrent Drivers)	0.0000054	0.376	0.183	10 (Yr 1)	0	0	--	--
Vibratory 14-inch H-Pile	0.0000054	0.005	0.235	6 (3 Yr 1, 3 Yr 2)	0	0	0	0
Vibratory 12-inch Timber Pile	0.0000054	0.005	0.286	8 (Yr 1)	0	0	--	--
Oscillator Install of 4-foot Drilled Shaft	0.0000054	0.000	0.169	88 (Yr 1)	0	0	--	--
Diamond Wire Saw Removal of 48--inch Drilled Shaft	0.0000054	0.000	2.290	6 (Yr 2)	--	--	0	0
24-inch Pile Clipper Removal of 12-inch Timber Pile	0.0000054	0.000	0.381	4 (Yr 1)	0	0	--	--

Common Bottlenose Dolphin

Estimated take using the Navy's density estimates for common bottlenose dolphins as described above resulted in zero take in both Year 1 and Year 2 as shown in Table 9. Therefore, as described above, we looked at other observational data. Common bottlenose dolphins have been rare visitors to Puget Sound. However, the WSDOT Seattle Multimodal Project at Colman Dock Year 3 IHA monitoring report observed common bottlenose dolphin at a rate of 6 per month (WSDOT 2020a). In-water work will occur for 113 days in Year 1 and 9 days in Year 2, which would equate to 33 dolphin takes in Year 1 (5.5 months × 6 dolphins/month) and 3 dolphin takes in Year 2 (0.5 months x 3 dolphins/month). A shutdown zone at the full distance of the level A harassment isopleths (≤ 55m) can be effectively applied to avoid Level A take. Therefore, BNSF has requested and NMFS proposes to authorize 33 takes by Level B harassment in Year 1 and 3 takes by Level B harassment in year in Year 2.

Table 9. Calculated Take of Bottlenose Dolphin

Activity	Species Density (animals/km^2)	Level A Area (km^2)	Level B Area (km^2)	Length of Activity (days)	Year 1 Estimated Take A	Year 1 Estimated Take B	Year 2 Estimated Take A	Year 2 Estimated Take B
Impact 36-inch Steel Pipe Pile (2 Concurrent Drivers)	0.0000054	0.376	0.183	10 (Yr 1)	0	0	--	--
Vibratory 14-inch H-Pile	0.0000054	0.005	0.235	6 (3 Yr 1, 3 Yr 2)	0	0	0	0
Vibratory 12-inch Timber Pile	0.0000054	0.005	0.286	8 (Yr 1)	0	0	--	--
Oscillator Install of 4-foot Drilled Shaft	0.0000054	0.000	0.169	88 (Yr 1)	0	0	--	--
Diamond Wire Saw Removal of 48-inch Drilled Shaft	0.0000054	0.000	2.290	6 (Yr 2)	--	--	0	0
24-inch Pile Clipper Removal of 12-inch Timber Pile	0.0000054	0.000	0.381	4 (Yr 1)	0	0	--	--
Total				122	0	0	0	0

Long-Beaked Common Dolphin

Using the Navy's density data, which was zero, estimated take of common dolphins was calculated to be zero in Year 1 and Year 2. Therefore, as described above, we looked at other observational data. Sightings of live dolphins throughout inside waters and Southern Puget Sound have been recorded in 2003, 2011-12, and 2016 –17. Group size ranged from 2 (in 2003 and 2011-12) to 5-12 (in 2016-2017) (Shuster *et al.* 2017). Since June 2016, several common dolphins have remained in Puget Sound, group sizes of 5-20 individuals are often reported and some of these groups stayed in the region for several months. Sightings of these animals mostly began in summer and early fall sometimes extending into winter months. (Shuster *et al.,* 2018). We conservatively predict that a group of 20 individuals will be taken on a monthly basis. The Level A harassment shutdown zone for mid-frequency hearing group will be implemented to minimize the severity of any Level A harassment that could occur. The in-water work would occur for 113 days in Year 1 and 9 days in Year 2, which would result in 110 takes (5.5 months × 20 dolphins/month) in Year 1 and 20 takes (1 month x 20 dolphins/month) in Year 2 by Level B harassment. BNSF has requested and NMFS proposes to authorize 110 takes of long-beaked common dolphin by Level B harassment in Year 1 and 10 takes by Level B harassment in year in Year 2.

Harbor Porpoise

Harbor porpoise density estimates based on the Navy's data were used to calculate requested and proposed take as shown in Table 10. Analysis of the size of the level A harassment zones multiplied by density associated with harbor porpoise predicted that two porpoises could be taken by Level A harassment during the 10 days that concurrent driving of 36-in steel piles occurs during year 1. However, take by Level A harassment is unlikely given that the threshold and associated PTS isopleth is based on the acoustic energy accrued over a specified time period and it is unlikely that a highly mobile animal such as the harbor porpoise would spend the that amount if time in the Level A harassment zone. However, given the larger size of the zone and the cryptic nature of harbor porpoises, we have precautionarily proposed to authorize 2 takes by Level A harassment for Year 1. The Level A harassment shut down zone for high frequency hearing group will be implemented to minimize severity of any Level A harassment takes that do occur. Since there will be no impact driving during Year 2, the size of the Level A harassment zone will not exceed 5 m and, therefore, no take by Level A harassment was requested and none has been proposed. BNSF has requested and NMFS proposes to authorize 12 takes of harbor porpoise by Level B harassment in Year 1 and 8 takes by Level B harassment in year in Year 2.

Table 10 – Calculated Take of Harbor Porpoise

Activity	Species Density (animals/km^2)	Level A Area (km^2)	Level B Area (km^2)	Length of Activity (days)	Year 1 Estimated Take A	Year 1 Estimated Take B	Year 2 Estimated Take A	Year 2 Estimated Take B
Impact 36-inch Steel Pipe Pile (2 Concurrent Drivers)	0.54	0.376	0.183	10 (Yr 1)	2	1	--	--
Vibratory 14-inch H-Pile	0.54	0.005	0.235	6 (3 Yr 1, 3 Yr 2)	0	1	0	1
Vibratory 12-inch Timber Pile	0.54	0.005	0.286	8 (Yr 1)	0	1	--	--
Oscillator Install of 4-foot Drilled Shaft	0.54	0.000	0.169	88 (Yr 1)	0	8	--	--
Diamond Wire Saw Removal of 48-inch Drilled Shaft	0.54	0.000	2.290	6 (Yr 2)	--	--	0	7
24-inch Pile Clipper Removal of 12-inch Timber Pile	0.54	0.000	0.381	4 (Yr 1)	0	1	--	--
Total				122	2	12	0	8

Harbor Seal

Harbor seal density estimates based on data from the Navy were initially used to calculate requested and proposed take (Table 11). These estimates, however, do not account for numerous seals feeding on migrating salmonids at Ballard Locks, especially during.summer (June – September) months. A new acoustic deterrent device was tested over two years to keep seals away from the Locks (Bogaard, Pers. Comm, 2022). A study report is currently being developed for publication. Study observers were primarily focused on behavioral effects of the deterrent on seals and monitored seal behavioral reactions during 30 minute observation periods up to eight times per day. Actual seal abundance was not recorded. However, observers noted that groups of 5-6 harbor seals were very common from late June through September during the salmon run, although smaller numbers were present throughout the year. It is likely that many of the same animals were observed multiple times across daily observation periods. The in-water work window runs from July 16, 2022 through February 15, 2023. Given this information, NMFS assumed for Year 1 that during the 54 in-water work days between July 16, 2022 and September 30, 2022, 5 harbor seals would be taken per day (270 takes). For the remaining 59 in-water work days between October 1, 2022 and February 15, 2023, a single harbor seal would be taken per day (59) for a total of 329 takes. There are 10 in-water work days that include concurrent impact driving of 36-inch piles when the Level A harassment isopleth is relatively large (1,826 m) (and also exceeds the Level B harassment isopleth (464 m)) so it is possible that Level A harassment could occur in some animals. Also, note that the constrained design of the lock system means that seals would likely spend extended periods in the confined area while feeding. NMFS conservatively assumes that all of these 10 in-water work days would occur during salmon migration (February 15 – Sept 30) and that up to one-third of seals taken per day (2) could be exposed to sound energy levels resulting in some degree of Level A harassment (20). The estimated takes by Level A harassment is subtracted from the Level B harassment take to avoid double-counting. Since a smaller number of seals expected to be present during non-migratory period and the seals would have little incentive to congregate near the locks in the absence of salmon, NMFS does not expect any Level A harassment of seals to occur. Therefore, NMFS is proposing during Year 1 to authorize 20 takes by Level A harassment and 309 takes by Level B harassment (329-20).

For Year 2, NMFS assumed that all 9 in-water work days would occur during salmon migration between July 16, 2023 and September 30, 2024 with up to 6 harbor seals taken per day (54). No Level A take harassment is proposed during Year 2 since the largest Level A isopleth for all planned activities is 2 m. However, the density-based estimate was 57 takes as shown in Table 11. Therefore, NMFS is proposing 57 takes of harbor seal by Level B harassment during Year 2.

Table 11. Calculated Take of Harbor Seal

Activity	Species Density (animals/km^2)	Level A Area (km^2)	Level B Area (km^2)	Length of Activity (days)	Year 1 Estimated Take A	Year 1 Estimated Take B	Year 2 Estimated Take A	Year 2 Estimated Take B
Impact 36-inch Steel Pipe Pile (2 Concurrent Drivers)	3.91	0.215	0.183	10 (Yr 1)	8	7	--	--
Vibratory 14-inch H-Pile	3.91	0.005	0.235	6 (3 Yr 1, 3 Yr 2)	0	3	0	3
Vibratory 12-inch Timber Pile	3.91	0.005	0.286	8 (Yr 1)	0	9	--	--
Oscillator Install of 4-foot Drilled Shaft	3.91	0.005	0.169	88 (Yr 1)	0	58	--	--
Diamond Wire Saw Removal of 48-inch Drilled Shaft	3.91	0.005	2.290	6 (Yr 2)	--	--	0	54
24-inch Pile Clipper Removal of 12-inch Timber Pile	3.91	0.005	0.381	4 (Yr 1)	0	6	--	--
TOTAL				122	8	83	0	57

California Sea Lion

BNSF initially considered California sea lion density estimates to calculate requested take, which resulted in relatively low estimates (4 takes in Year 1 and 3 takes in Year 2 by Level B harassment) as shown in Table 12. However, California sea lions are known to frequent the Ballard Locks to feed on migrating salmon (KUOW, 2020). While no formal research studies have recorded individual numbers of California sea lions at Ballard Locks, news articles reported accounts of California sea lion sightings which ranged from a few to many more (Hakai Magazine, 2018; King 5 News, 2021). Observers associated with the acoustic deterrent device study described above, reported that California sea lions were less numerous than harbor seals, having been seen at a rate of 2-3 per day during peak salmonid migration (Bogaard, Pers. Comm. 2022). They were less common during non-migratory seasons. Given this information, NMFS assumed for Year 1 that during the 54 in-water work days between July 16, 2022 and September 30, 2022, 2 California sea lions would be taken per day (108). For the remaining 59 in-water work days between October 1, 2022 and February 15, 2023, a single California sea lion would be taken very third day (20). Take by Level A harassment is possible, but unlikely, given that the largest Level A harassment isopleth is 60 m (with a 10 m shutdown zone for otariids) but only during 10 in-water work days which would include impact driving during Year 1. The Level A harassment zone during all other in-water work days in both Year 1 and Year 2 is 1 m or less. A California sea lion would not be expected to remain within the injury zone long enough (5.4 hours) to accrue the amount energy that would result in take Level A harassment. As such, NMFS is proposing during Year 1 to authorize 128 takes by Level B harassment. No takes by Level A harassment are proposed.

For Year 2, NMFS assumed that all 9 in-water work days would occur during peak salmon migration between July 16, 2023 and September 30, 2024 with up to 2

California sea lions taken per day (18). NMFS is proposing to authorize 18 takes of California sea lion by Level B harassment. No Level A take harassment is proposed.

Table 12. Calculated Take of California Sea Lions by Level B Harassment

Activity	Species Density (animals/km^2)	Level A Area (km^2)	Level B Area (km^2)	Length of Activity (days)	Year 1 Estimated Take A	Year 1 Estimated Take B	Year 2 Estimated Take A	Year 2 Estimated Take B
Impact 36-inch Steel Pipe Pile (2 Concurrent Drivers)	0.2211	0.023	0.183	10 (Yr 1)	0	0	--	--
Vibratory 14-inch H-Pile	0.2211	0.004	0.235	6 (3 Yr 1, 3 Yr 2)	0	0	0	0
Vibratory 12-inch Timber Pile	0.2211	0.004	0.286	8 (Yr 1)	0	1	--	--
Oscillator Install of 4-foot Drilled Shaft	0.2211	0.000	0.169	88 (Yr 1)	0	3	--	--
Diamond Wire Saw Removal of 48-inch Drilled Shaft	0.2211	0.000	2.290	6 (Yr 2)	--	--	0	3
24-inch Pile Clipper Removal of 12-inch Timber Pile	0.2211	0.000	0.381	4 (Yr 1)	0	0	--	--
TOTAL						4		3

Stellar Sea Lion

Stellar sea lion density estimates were initially used to calculate requested take as shown in Table 13. Based on the density data, BNSF has requested a single take for both Year 1 and Year 2. Given the large number of in-water work days in Year 1, NMFS has precautionarily increased the proposed Level B harassment to 5 takes while maintaining the 1 proposed take by Level B harassment as calculated by density estimates in Year 2. Monitors with the acoustic deterrent study did not observe any Steller sea lions during the two years that the study was underway (Bogaard, Pers. Comm, 2022).

Table 13. Calculated Take of Steller Sea Lions by Level B Harassment

Activity	Species Density (animals/km^2)	Level A Area (km^2)	Level B Area (km^2)	Length of Activity (days)	Year 1 Estimated Take A	Year 1 Estimated Take B	Year 2 Estimated Take A	Year 2 Estimated Take B
Impact 36-inch Steel Pipe Pile (2 Concurrent Drivers)	0.0478	0.023	0.183	10 (Yr 1)	0	0	--	--
Vibratory 14-inch H-Pile	0.0478	0.004	0.235	6 (3 Yr 1, 3 Yr 2)	0	0	0	1
Vibratory 12-inch Timber Pile	0.0478	0.004	0.286	8 (Yr 1)	0	0	--	--
Oscillator Install of 4-foot Drilled Shaft	0.0478	0.000	0.169	88 (Yr 1)	0	1	--	--
Diamond Wire Saw Removal of 48-inch Drilled Shaft	0.0478	0.000	2.290	6 (Yr 2)	--	--	0	0
24-inch Pile Clipper Removal of 12-inch Timber Pile	0.0478	0.000	0.381	4 (Yr 1)	0	0	--	--
TOTAL						1		1

The estimated take by Level A and Level B harassment for all authorized species and stocks by year, and percentage take by stock is shown in Table 14.

Table 14. Estimated Take by Level A and Level B Harassment, by Species, Stock and Year, and Percentage Take by Stock

Common Name	Stock	Abundance	IHA Year 1		Total Take as percentage of stock	IHA Year 2		Total Take as percentage of stock.
			Take A Request	Take B Request		Take A Request	Take B Request	
Minke Whale	California/Oregon/ Washington	915	—	6	0.66	—	1	0.11
Common Bottlenose Dolphin	California/Oregon/ Washington offshore	3,477	—	33	0.95	—	3	0.09
Long-beaked Common Dolphin	California	83,379	—	110	0.13	—	20	0.01
Harbor Porpoise	Washington Inland Waters	11,233	—	12	0.11	—	8	0.07
Harbor Seal	Washington Northern Inland Waters	1,088	20	309	32.6	—	57	5.2
California Sea Lion	United States	257,606	—	108	0.04	—	20	<0.01
Stellar Sea Lion	Eastern U.S.	43,201	—	5	0.01	—	1	<0.01

Proposed Mitigation

In order to issue an IHA under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of effecting the least practicable impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stock for taking for certain subsistence uses (latter not applicable for this action). NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting the activity or other means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, we carefully consider two primary factors:

(1) The manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as planned), the likelihood of effective implementation (probability implemented as planned); and

(2) The practicability of the measures for applicant implementation, which may consider such things as cost, impact on operations, and, in the case of a military readiness activity, personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

In addition to the measures described later in this section, BNSF will employ the following mitigation measures:

- BNSF must ensure that construction supervisors and crews, the monitoring team, and relevant BNSF staff are trained prior to the start of activities subject to these IHAs, so that responsibilities, communication procedures, monitoring protocols, and operational procedures are clearly understood. New personnel joining during the project must be trained prior to commencing work;
- Monitoring must take place from 30 minutes prior to initiation of pile driving activity (*i.e.*, pre-start clearance monitoring) through 30 minutes post-completion of pile driving activity;
- If a marine mammal is observed entering or within the shutdown zones indicated in Table 14, pile driving activity must be delayed or halted;
- Pile driving activity must be halted upon observation of either a species for which incidental take is not authorized or a species for which incidental take has been authorized but the authorized number of takes has been met, entering or within the harassment zone (as shown in Table 14); and
- BNSF, construction supervisors and crews, PSOs, and relevant BNSF staff must avoid direct physical interaction with marine mammals during construction activity. If a marine mammal comes within 10 meters of such activity, operations must cease and vessels must reduce speed to the minimum level required to maintain steerage and safe working conditions, as necessary to avoid direct physical interaction.

The following mitigation measures apply to BNSF’s in-water construction activities:

- *Establishment of Shutdown Zones*- BNSF will establish shutdown zones for all pile driving and removal activities. The purpose of a shutdown zone is generally to define an area within which shutdown of the activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area). Shutdown zones will vary based on the activity type and marine mammal hearing group. In addition to the shutdown zones listed in Table 15, BNSF will shut down construction activity if a humpback or southern resident killer whale is observed approaching or within the specified Level B harassment zone.

- *Protected Species Observers*- The placement of Protected Species Observers (PSOs) during all pile driving and removal activities (described in detail in the **Proposed Monitoring and Reporting** section) will ensure that the entire shutdown zone is visible during pile driving and removal. Should environmental conditions deteriorate such that marine mammals within the entire shutdown zone would not be visible (*e.g.*, fog, heavy rain), drilling, cutting, clipping, pile driving and removal must be delayed until the PSO is confident marine mammals within the shutdown zone could be detected.

Table 15. Shutdown Zones for each Hearing Group and Level B Harassment Zones during Pile Installation and Removal (meters)

Pile Type, Size, and Pile Driving Method	LF	MF	HF	Phocid	Otariid	Level B Harassment zone
Scenario 1. Single 36-inch Pipe	1,000	40	1,200	10	10	500
Scenario 2. 2 Concurrent 36-inch Pipe	1,600	60	1,900	10	10	500
14-inch H-Pile	10	10	10	10	10	1,000
12-inch Timber Vibratory	10	10	10	10	10	1,400
48-inch Drilled Shaft Oscillatory Installation	10	10	10	10	10	400
48-inch Concrete-lined Steel Shaft Diamond Wire Saw Removal	10	10	10	10	10	5,900

12-inch Timber Pile Clipper	10	10	10	10	10	1,900

- *Monitoring for Level A and Level B Harassment*- BNSF will monitor the Level B harassment zones to the extent practicable and the entire Level A harassment zones. Monitoring zones provide utility for observing by establishing monitoring protocols for areas adjacent to the shutdown zones. Monitoring zones enable observers to be aware of and communicate the presence of marine mammals in the project area outside the shutdown zone and thus prepare for a potential cessation of activity should the animal enter the shutdown zone. At least three PSOs would monitor harassment zones during all in-water construction activities. PSO monitoring stations are described below in the **Proposed Monitoring and Reporting** section.
- *Pre-activity Monitoring*- Prior to the start of daily in-water construction activity, or whenever a break in drilling, clipping, cutting, pile driving/removal of 30 minutes or longer occurs, PSOs will observe the shutdown and monitoring zones for a period of 30 minutes. The shutdown zone will be considered cleared when a marine mammal has not been observed within the zone for that 30-minute period. If a marine mammal is observed within the shutdown zone, a soft-start cannot proceed until the animal has left the zone or has not been observed for 15 minutes. When a marine mammal for which Level B harassment take is authorized is present in the Level B harassment zone, activities may begin and Level B harassment take will be recorded. If the entire Level B harassment zone is not visible at the start of construction, pile driving activities can begin. If work ceases for more than 30 minutes, the pre-activity monitoring of the shutdown zones will commence.

- *Soft Start*- Soft-start procedures are believed to provide additional protection to marine mammals by providing warning and/or giving marine mammals a chance to leave the area prior to the hammer operating at full capacity. For impact pile driving, contractors will be required to provide an initial set of three strikes from the hammer at reduced energy, followed by a 30-second waiting period. This procedure will be conducted three times before impact pile driving begins. Soft start will be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of 30 minutes or longer.
- *Bubble Curtain*- BNSF will use a marine pile-driving energy attenuator (*i.e.*, air bubble curtain system) during impact pile driving. The use of sound attenuation will reduce SPLs and the size of the zones of influence for Level A harassment and Level B harassment. Bubble curtains will meet the following requirements:
    - The bubble curtain must distribute air bubbles around 100 percent of the piling circumference for the full depth of the water column;
    - The lowest bubble ring must be in contact with the substrate for the full circumference of the ring, and the weights attached to the bottom ring shall ensure 100 percent substrate contact. No parts of the ring or other objects shall prevent full substrate contact; and
    - Air flow to the bubblers must be balanced around the circumference of the pile.

Based on our evaluation of BNSF's proposed measures, NMFS has preliminarily determined that the proposed mitigation measures provide the means effecting the least practicable impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Proposed Monitoring and Reporting

In order to issue an IHA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the proposed action area. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density);
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas);
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;
- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and

- Mitigation and monitoring effectiveness.

Visual Monitoring

Marine mammal monitoring must be conducted in accordance with the Marine Mammal Monitoring Plan found in Appendix E in the application. Marine mammal monitoring during drilling, clipping, cutting, pile driving and removal must be conducted by NMFS-approved PSOs in a manner consistent with the following:

- Independent PSOs (*i.e.*, not construction personnel) who have no other assigned tasks during monitoring periods must be used;
- At least one PSO must have prior experience performing the duties of a PSO during construction activity pursuant to a NMFS-issued incidental take authorization;
- Other PSOs may substitute other relevant experience, education (degree in biological science or related field), or training for prior experience performing the duties of a PSO during construction activity pursuant to a NMFS-issued incidental take authorization; and
- PSOs must be approved by NMFS prior to beginning any activity subject to this IHA.

PSOs must have the following additional qualifications:

- Ability to conduct field observations and collect data according to assigned protocols;
- Experience or training in the field identification of marine mammals, including the identification of behaviors;
- Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations;
- Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times

when in-water construction activities were conducted; dates, times, and reason for implementation of mitigation (or why mitigation was not implemented when required); and marine mammal behavior; and

- Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary;

A minimum of three PSOs located at positions designated in Figure 1 and Figure 2 of the Marine Mammal Monitoring Plan found in Appendix E of the Application must monitor harassment zones during all in-water construction activities. One PSO would be stationed in close proximity to the construction site. A second PSO would be stationed at Bay Terrace Road which is located east of the Bridge 6.3 on the southern side of the Ship Canal. This location would provide views of ensonified areas radiating into Shilshole Bay as well as waters east of the mouth of the Ship Canal. A third PSO would be located on the north side of the Ship Canal at the Northwest 60th Street Viewpoint west of Bridge 6.3. This location provides views westward towards the mouth of the Ship Canal. A fourth PSO must be on a boat positioned in Puget Sound when a wire saw is being utilized to monitor the extended Level B harassment zone associated with this equipment. A wire saw would be employed on approximately 6 in-water work days. If hydroacoustic monitoring results of diamond wire saw cutting activities show that the entirety of the Level B harassment zone may be viewed by from land-based PSOs, then the PSO on the boat may not be deployed. All results from hydroacoustic monitoring, described in the next section, must be submitted to NMFS. NMFS must approve the removal of the boat-based PSO and modification of the new harassment isopleth.

Monitoring will be conducted 30 minutes before, during, and 30 minutes after drilling, clipping, cutting, pile driving/removal activities. In addition, observers shall record all incidents of marine mammal occurrence, regardless of distance from activity, and shall document any behavioral reactions in concert with distance from piles being driven or removed. Drilling, clipping, cutting, Pile driving activities include the time to install or remove a single pile or series of piles, as long as the time elapsed between uses of the drilling, clipping, cutting, pile driving equipment is no more than 30 minutes.

Hydroacoustic Monitoring

Hydroacoustic monitoring will be conducted during in-water pile-driving and wire saw activities and recorded source levels will be compared to the reported sound levels employed as part of this application to determine harassment isopleths modeled in this application. Information about methods, data collection, and reporting are described in the Acoustic Monitoring Plan in Appendix F of the Application. The following representative subsets will be measured:

- A minimum of 15, 36-inch impact driven piles for the Project in the following subsets:
    1. A minimum of 5 piles towards the beginning of pile driving activity;
    2. A minimum of 5 piles towards the middle of pile driving activity;
    3. A minimum of 5 piles towards the latter pile driving activity.
- A minimum of 4, 48-inch drilled shafts oscillated for the Project in the following subsets:
    1. A minimum of 2 drilled shafts towards the beginning of the activity;
    2. A minimum of 2 drilled shafts towards the end of the activity.
- A minimum of 2 48-inch drilled shafts will be monitored when cut with a wire saw.

Reporting

BNSF must submit its draft reports on all monitoring conducted under the IHAs within 90 calendar days of the completion of monitoring or 60 calendar days prior to the requested issuance of any subsequent IHA for construction activity at the same location, whichever comes first. A final report must be prepared and submitted within 30 calendar days following receipt of any NMFS comments on the draft report. If no comments are received from NMFS within 30 calendar days of receipt of the draft report, the report shall be considered. The report will include an overall description of work completed, a narrative regarding marine mammal sightings, and associated PSO data sheets. Specifically, the report must include:

- Dates and times (begin and end) of all marine mammal monitoring;
- Construction activities occurring during each daily observation period, including how many and what type of piles were driven or removed and by what method: drilling, cutting, clipping, impact driving, and vibratory driving and removal ; duration of driving time for each pile (vibratory) and number of strikes per pile (impact driving);
- PSO locations during marine mammal monitoring;
- Environmental conditions during monitoring periods (at beginning and end of PSO shift and whenever conditions change significantly), including Beaufort sea state and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon, and estimated observable distance;
- Name of PSO who sighted the animal(s) and PSO location and activity at time of sighting;
- Time of sighting;
- Identification of the animal(s) (e.g., genus/species, lowest possible taxonomic level, or unidentified), PSO confidence in identification, and the composition of the group if there is a mix of species;
- Distance and location of each observed marine mammal relative to the pile being driven for each sighting;
- Estimated number of animals (min/max/best estimate);

- Estimated number of animals by cohort (adults, juveniles, neonates, group composition, etc.);
- Animal's closest point of approach and estimated time spent within the harassment zone;
- Description of any marine mammal behavioral observations (*e.g.*, observed behaviors such as feeding or traveling), including an assessment of behavioral responses thought to have resulted from the activity (*e.g.,* no response or changes in behavioral state such as ceasing feeding, changing direction, flushing, or breaching);
- Number of marine mammals detected within the harassment zones, by species; and
- Detailed information about implementation of any mitigation (*e.g*., shutdowns and delays), a description of specific actions that ensued, and resulting changes in behavior of the animal(s), if any.

The acoustic monitoring report must contain the informational elements described in the Acoustic Monitoring Plan and, at minimum, must include:

- Hydrophone equipment and methods: recording device, sampling rate, distance (m) from the pile where recordings were made; depth of water and recording device(s);
- Type and size of pile being driven or cut, substrate type, method of driving or cutting during recordings (e.g., hammer model and energy), and total pile driving or cutting duration;
- Whether a sound attenuation device is used and, if so, a detailed description of the device used and the duration of its use per pile;
- For impact pile driving (per pile): Number of strikes; depth of substrate to penetrate; pulse duration and mean, median, and maximum sound levels (dB re: 1

μPa): root mean square sound pressure level (SPLrms); cumulative sound exposure level (SELcum), peak sound pressure level (SPLpeak), and single-strike sound exposure level (SELs-s);

- For wire saw cutting (per pile): Duration of driving per pile; mean, median, and maximum sound levels (dB re: 1 μPa): root mean square sound pressure level (SPLrms), cumulative sound exposure level (SELcum) (and timeframe over which the sound is averaged); and
- One-third octave band spectrum and power spectral density plot.

In the event that personnel involved in the construction activities discover an injured or dead marine mammal, the IHA-holder shall report the incident to the Office of Protected Resources (OPR) (301-427-8401), NMFS and to the West Coast Region Stranding Hotline (866-767-6114) as soon as feasible. If the death or injury was clearly caused by the specified activity, the IHA-holder must immediately cease the specified activities until NMFS is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of the IHA. The IHA-holder must not resume their activities until notified by NMFS.

The report must include the following information:

i. Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);

ii. Species identification (if known) or description of the animal(s) involved;

iii. Condition of the animal(s) (including carcass condition if the animal is dead);

iv. Observed behaviors of the animal(s), if alive;

v. If available, photographs or video footage of the animal(s); and

vi. General circumstances under which the animal was discovered.

Negligible Impact Analysis and Determination

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through harassment, NMFS considers other factors, such as the likely nature of any responses (*e.g.*, intensity, duration), the context of any responses (*e.g.*, critical reproductive time or location, migration), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS's implementing regulations (54 FR 40338; September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

To avoid repetition, this introductory discussion of our analyses applies to all of the species listed in Table 14, given that many of the anticipated effects of this project on different marine mammal stocks are expected to be relatively similar in nature. Where there are meaningful differences between species or stocks in anticipated individual responses to activities, impact of expected take on the population due to differences in population status, or impacts on habitat, they are described independently in the analysis below, such as for the potential repeated and prolonged exposure of habituated harbor seals that feed on salmonids traversing through the lock system. The analysis below applies to both the Year 1 and Year 2 proposed IHAs, except where noted otherwise.

Drilling, clipping, cutting, Pile driving and removal activities associated with the project, as outlined previously, have the potential to disturb or displace marine mammals. Specifically, the specified activities may result in take, in the form of Level A harassment and Level B harassment from underwater sounds generated by drilling, clipping, cutting, pile driving and removal. Potential takes could occur if marine mammals are present in zones ensonified above the thresholds for Level A or Level B harassment, identified above, while activities are underway.

The nature of the drilling, clipping, cutting, pile driving project precludes the likelihood of serious injury or mortality. The mitigation is expected to ensure that no Level A harassment occurs to any species except harbor seal. The nature of the estimated takes anticipated to occur are similar among all species and similar in Year 1 and Year 2, other than the potential Level A harassment take of harbor seal in Year 1, described further below and the likely comparatively higher number of repeated takes of some small number of harbor seals by Level B harassment during both Year 1 and Year 2

For all species other than harbor seal, take would be limited to Level B harassment (behavioral disturbance and TTS) only. Effects on individuals that are taken by Level B harassment, on the basis of reports in the literature as well as monitoring from other similar activities, will likely include reactions such as increased swimming speeds, increased surfacing time, or decreased foraging (if such activity were occurring). Marine mammals present in the vicinity of the action area and taken by Level B harassment are most likely to move away from and avoid the area of elevated noise levels during in-water construction activities. The project site itself is located along a highly developed waterfront with high amounts of vessel traffic and, therefore, we expect that most animals disturbed by project sound would simply avoid the area and use more-preferred habitats. These short-term behavioral effects are not expected to affect marine mammals' fitness, survival, and reproduction due to the limited geographic area that would be affected in comparison to the much larger habitat for marine mammals in the Puget Sound. Harbor seals that are habituated to in-water construction noise could be exposed for 5.4 hours per day for up to 10 consecutive days during impact driving activities in Year 1 only. These animals would likely remain in close proximity to the locks and may be exposed to enough accumulated energy to result in TTS or PTS (described below). Longer duration exposure could result in TTS in some cases if exposures occur within the Level B TTS zone. As discussed earlier in this document, TTS is a temporary loss of hearing sensitivity when exposed to loud sound, and the hearing threshold is expected to recover completely within minutes to hours. Any behavioral effects of repeated or long duration exposures are not expected to negatively impact survival or reproductive success of any individuals. Similarly, given that the exposure to these individuals is not expected to exceed 10 consecutive days for 5.4 or fewer hours at a time for any individual, any limited energetic impacts from the interruption of foraging or other important behaviors are not expected to affect the reproductive success of any individual harbor seals.

In addition to the expected effects resulting from proposed Level B harassment, we anticipate that a limited number of habituated harbor seals (20) may sustain some Level A harassment in the form of auditory injury during 10 days of impact driving proposed for Year 1 only. However, any animals that experience PTS would likely only receive slight PTS, *i.e.* minor degradation of hearing capabilities within regions of hearing that align most completely with the frequency range of the energy produced by pile driving (*i.e.*, the low-frequency region below 2kHz), not severe hearing impairment or impairment in the reigns of greatest hearing sensitivity. If hearing impairment does occur, it is most likely that the affected animal would lose a few dBs in its hearing sensitivity, which in most cases, is not likely to meaningfully affect its ability to forage and communicate with conspecifics. These takes by Level A harassment (*i.e.*, a small degree of PTS) of habituated harbor seals are not expected to accrue in a manner that would affect the reproductive success or survival of any individuals, much less result in adverse impacts on the species or stock. As described above, we expect that marine mammals would be likely to move away from a sound source that represents an aversive stimulus, especially at levels that would be expected to result in PTS, given sufficient notice through use of soft start.

The project is also not expected to have significant adverse effects on affected marine mammals' habitats. The project activities will not modify existing marine mammal habitat for a significant amount of time. The activities may cause some fish to leave the area of disturbance, thus temporarily impacting marine mammals' foraging opportunities in a limited portion of the foraging range; but, because of the short duration of the activities and the relatively small area of the habitat that may be affected, the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences.

Portions of the southern resident killer whale range are within the proposed project area and the entire Puget Sound is designated as critical habitat for these whales under the ESA. However, BNSF would be required to shut down and suspend pile driving or pile removal activities when this stock is detected in the vicinity of the project area. We anticipate that take of southern resident killer whale would be avoided. There are no other known important areas for other marine mammals, such as feeding or pupping, areas.

In summary and as described above, the following factors primarily support our preliminary determination that the impacts resulting from this activity are not expected to adversely affect the species or stock through effects on annual rates of recruitment or survival:

- No mortality or serious injury is anticipated or authorized.

- For all species except harbor seal and only during Year 1, no Level A harassment is anticipated or proposed for authorization.
- The Level A harassment exposures to habituated harbor seals in Year 1 only are anticipated to result in slight PTS, within the lower frequencies associated with impact pile driving.
- Though a small number of habituated harbor seals will accrue Level B harassment in the form of TTS from repeated days of exposure, hearing thresholds are expected to completely recover within minutes to hours.
- Anticipated effects of Level B harassment in the form of behavioral modification would be temporary.
- Although a small portion of the southern resident killer whale critical habitat is within the project area, strict mitigation measures such as implementing shutdown measures and suspending pile driving are expected to avoid take of this stock. No other important habitat for marine mammals exist in the vicinity of the project area.
- We do not expect significant or long-term negative effects to marine mammal habitat.

Year 1 IHA – Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS preliminarily finds that the total marine mammal take from BNSF's construction activities will have a negligible impact on all affected marine mammal species or stocks.

Year 2 IHA – Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS preliminarily finds that the total marine mammal take from BNSF's construction activities will have a negligible impact on all affected marine mammal species or stocks.

Small Numbers

As noted above, only small numbers of incidental take may be authorized under sections 101(a)(5)(A) and (D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals. When the predicted number of individuals to be taken is fewer than one third of the species or stock abundance, the take is considered to be of small numbers. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

The amount of take NMFS proposes to authorize is below one third of the estimated stock abundance for all species during both Year 1 and Year 2. The proposed take of individuals during Year 1 is less than 32.6 percent for harbor seals and less than 1 percent for all other authorized species. During year 2 the proposed take of individuals is less than 5.2 percent of the abundance of the affected species or stock as shown in Table 14. Note that harbor seal take during Year 1 likely includes multiple repeated takes of some small group of individuals. Similarly, for all other authorized species, the proposed take numbers probably represent conservative estimates because they assume all takes are of different individual animals, which is unlikely to be the case. Some individuals may return multiple times in a day, but PSOs would count them as separate takes if they cannot be individually identified.

Year 1 IHA- Based on the analysis contained herein of the activity (including the mitigation and monitoring measures) and the anticipated take of marine mammals, NMFS preliminarily finds that small numbers of marine mammals will be taken relative to the population size of the affected species or stocks in Year 1 of the project.

Year 2 IHA- Based on the analysis contained herein of the activity (including the mitigation and monitoring measures) and the anticipated take of marine mammals, NMFS preliminarily finds that small numbers of marine mammals will be taken relative to the population size of the affected species or stocks in Year 2 of the project.

Unmitigable Adverse Impact Analysis and Determination

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated by this action. Therefore, NMFS has determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

Endangered Species Act

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. 1531 *et seq*.) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the issuance of IHAs, NMFS consults internally whenever we propose to authorize take for endangered or threatened species

No incidental take of ESA-listed species is proposed for authorization or expected to result from this activity. Therefore, NMFS has determined that formal consultation under section 7 of the ESA is not required for this action.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue two consecutive IHA's to BNSF for conducting maintenance of Bridge 6.3 in Kings County, WA from July 16, 2022 to July, 15, 2023 (Year 1) and July 16, 2023 to July 15, 2024 (Year 2), provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. Drafts of the proposed IHAs can be found at *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act*.

Request for Public Comments

We request comment on our analyses, the proposed authorization, and any other aspect of this notification of proposed IHAs for the proposed action. We also request at this time comment on the potential Renewal of the proposed IHAs as described in the paragraph below. Please include with your comments any supporting data or literature citations to help inform decisions on the request for these IHAs or a subsequent Renewal IHA.

On a case-by-case basis, NMFS may issue a one-time, one-year Renewal IHA following notice to the public providing an additional 15 days for public comments when (1) up to another year of identical or nearly identical activities as described in the **Description of Proposed Activities** section of this notification is planned or (2) the activities as described in the **Description of Proposed Activities** section of this notification would not be completed by the time the IHA expires and a Renewal would allow for completion of the activities beyond that described in the *Dates and Duration* section of this notification, provided all of the following conditions are met:

- A request for renewal is received no later than 60 days prior to the needed Renewal IHA effective date (recognizing that the Renewal IHA expiration date cannot extend beyond one year from expiration of the initial IHA);

- The request for renewal must include the following:

(1) An explanation that the activities to be conducted under the requested Renewal IHA are identical to the activities analyzed under the initial IHA, are a subset of the activities, or include changes so minor (*e.g.*, reduction in pile size) that the changes

do not affect the previous analyses, mitigation and monitoring requirements, or take estimates (with the exception of reducing the type or amount of take); and

(2) A preliminary monitoring report showing the results of the required monitoring to date and an explanation showing that the monitoring results do not indicate impacts of a scale or nature not previously analyzed or authorized.

Upon review of the request for Renewal, the status of the affected species or stocks, and any other pertinent information, NMFS determines that there are no more than minor changes in the activities, the mitigation and monitoring measures will remain the same and appropriate, and the findings in the initial IHA remain valid.

Dated: January 25, 2022.

Kimberly Damon-Randall,

Director, Office of Protected Resources,

National Marine Fisheries Service.

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